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(PATENT)

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Magdy M. SALAMA et al.

Before the Board of Appeals

Application No.: 10/630,684

Confirmation No.: 7661

Filed: July 31, 2003

Art Unit: 2838

For: HIGH-VOLTAGE POWER SUPPLY

Examiner: Gary L. Laxton

APPEAL BRIEF

MS Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May 19, 2006

Sir:

As required under § 41.37(a), this brief is being filed after the filing of the Notice of Appeal, and is in furtherance of said Notice of Appeal and Request for Pre-Appeal Brief Conference filed February 6, 2006.

The fees required under § 41.20(b)(2), and any required petition for extension of time, if applicable, for filing this brief and fees related thereto, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1206:

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For: HIGH-VOLTAGE POWER SUPPLY	Examiner: Gary L. Laxton

APPEAL BRIEF ON BEHALF OF APPELLANTS: Magdy M. SALAMA et al.

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Sir:

I. REAL PARTY IN INTEREST

The real party in interest for this application is the Assignee, Honeywell International Inc., 101 Columbia Road, Morris Township, New Jersey 07962.

II. RELATED APPEALS AND/OR INTERFERENCES

There are no related appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-31 are currently pending in this application. Claims 1, 18, and 31 are independent claims. All pending claims stand rejected under 35 U.S.C. §103(a).

IV. STATUS OF AMENDMENTS

No after Final amendments have been submitted. Therefore, no Amendment after Final has been granted or refused entry.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

In one aspect, the claimed invention is a high-voltage power supply. (Fig. 1, element 10). The high-voltage power supply comprises: a power scaling section (Fig. 2, element 130) receiving an input voltage signal and converting the input voltage signal to a controllable DC voltage (specification, paragraph [0020]); a push-pull converter (Fig. 2, element 140) for converting the controllable DC voltage to a high-frequency wave (specification, paragraph [0021]); and a voltage multiplier (Figure 1, element 250) receiving the high-frequency wave generated by the push-pull converter and performing successive voltage doubling operations to generate a high-voltage DC output, the generated high-voltage DC output being varied as the controllable DC voltage varies (specification, paragraph [0027]). Therefore, the high-voltage power supply according to this aspect of the claimed invention generates a variable high-voltage output, based on the controllable DC voltage generated by the power scaling section, using a push-pull converter to convert a controllable DC voltage to a high-frequency wave and using a voltage multiplier to perform successive voltage doubling operations on the high-frequency wave output by the push-pull converter to achieve the desired high voltage output (see e.g., specification, paragraphs [0017]-[0018]).

The present invention further provides that the high-frequency wave generated by the push-pull converter is a square wave (specification, paragraph [0021]), and further provides that the

frequency of the high-frequency wave generated by the push-pull converter is approximately 100kHz (specification, paragraph [0017]).

The present invention further provides that the voltage multiplier includes a plurality of voltage doubler stages on a circuit board (Fig. 4, elements 210-1...210-n) and that the high-voltage power supply further comprises an insulation system associated with the circuit board, wherein the insulation system is a multi-layer system of *n* layers of insulation and *m* conducting strips positioned between successive insulating layers (Fig. 8, elements 252-1...252-n, specification, paragraph [0033]). The present invention further provides that the plurality of voltage doubler stages are divided among multiple circuit boards, separate from the power scaling section and the push-pull converter (Fig. 7, Board 1 - Board 4; specification, paragraph [0032]). The present invention further provides that the plurality of voltage doubler stages of the voltage multiplier include capacitors arranged in a pattern in which adjacent capacitors are non-parallel, so as to diverge on one end (Fig. 9, elements 410; specification paragraph [0035]). These features provide effective thermal management and insulation for a high-voltage power supply (HVPS), enabling use of a high-frequency square-wave (e.g., 100 kHz) at high voltage levels (e.g., adjustable output up to approximately 30kV) without the potential for "flash over" (sparks) in a reduced size (specification, paragraphs [0043], [0045]).

According to another aspect, the present invention is a high-voltage power supply (Fig. 1, element 10) comprising: a power scaling section (Fig. 2, element 130) receiving an input voltage signal and converting the input voltage signal to a controllable DC voltage (specification, paragraph [0020]); a push-pull converter (Fig. 2, element 140) for converting the controllable DC voltage to a high-frequency wave, the high-frequency wave having a frequency greater than approximately 20 kHz (specification, paragraph [0021]); and a voltage multiplier (Fig. 1, element 200) receiving the high-frequency wave generated by the push-pull converter and performing successive voltage doubling operations to generate a high-voltage DC output, the generated high-voltage DC output being varied as the controllable DC voltage varies so as to output various desired output voltage levels in a range that includes voltages up to approximately 30kV (specification, paragraphs [0018], [0019], [0027]).

According to another aspect, the present invention is a method for providing high-voltage power, comprising: receiving an input voltage signal and scaling said input voltage signal to a controllable DC voltage (specification, paragraph [0020]); converting the controllable DC voltage to a high-frequency wave (specification, paragraph [0021]); and performing voltage multiplication on the high-frequency wave generated by said converting step to generate a high-voltage DC output, the generated high-voltage DC output being varied as said controllable DC voltage varies (specification, paragraph [0027]).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The Final Office Action provides the following grounds of rejection for review on appeal:

1. Claims 1, 7-12, 18-22, and 24-31 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over *Shelly* (U.S. Patent 4,251,857) in view of *Gallios et al.* (U.S. Patent 4,893,227);

2. Claims 2-6 and 23 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over *Shelly* in view of *Gallios* and *Gak* (U.S. Patent 6,141,225); and

3. Claims 13-17 stand rejected under 35 U.S.C. § 103 as allegedly being unpatentable over *Shelly* in view of *Gallios*, and further in view of *Adasko et al.* (U.S. Patent 5,414,224).

VII. ARGUMENTS

A. Issue 1: The Examiner's Rejection under 35 U.S.C. § 103(a) based on *Shelly* in view of *Gallios*, as Applied to Claim 1, 7-12, 18-22, and 24-31, Fails to Establish *Prima Facie* Obviousness

1. Argument Summary

The reasoning provided in support of the rejection of claims under 35 U.S.C. §103(a) as being unpatentable over *Shelly* in view of *Gallios* fails to establish *prima facie* obviousness of any of the rejected claims. Specifically, the deficiencies of the rejection are at least that the rejection

misinterprets teachings of the applied references and fail to establish that one having ordinary skill in the art would have been motivated to modify or combine teachings of *Shelly* and *Gallios* in a manner that satisfies all claim features.

2. Legal Requirements of *Prima Facie* Obviousness

To establish *prima facie* obviousness, all claim limitations must be taught or suggested by the prior art and the asserted modification or combination of the prior art must be supported by some teaching, suggestion, or motivation in the applied references or in knowledge generally available to one skilled in the art. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). The prior art must suggest the desirability of the modification in order to establish a *prima facie* case of obviousness. *In re Brouwer*, 77 F.3d 422, 425, 37 USPQ2d 1663, 1666 (Fed. Cir. 1995). It can also be said that the prior art must collectively suggest or point to the claimed invention to support a finding of obviousness. *In re Hedges*, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir. 1986); *In re Ehrreich*, 590 F.2d 902, 908-909, 200 USPQ 504, 510 (C.C.P.A. 1979). When considering the differences between the primary reference and the claimed invention, the question for assessing obviousness is not whether the differences themselves would have been obvious, but instead whether the claimed invention as a whole would have been obvious. *Stratoflex Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983).

3. The Rejection Fails to Establish *Prima Facie* Obviousness of Independent Claim 31

Independent claim 31 is directed to a high-voltage power supply (HVPS). The HVPS of claim 31 comprises: a power scaling section receiving an input voltage signal and converting the input voltage signal to a controllable DC voltage; a push-pull converter for converting the controllable DC voltage to a high-frequency wave, the high-frequency wave having a frequency greater than approximately 20 kHz; and a voltage multiplier receiving the high-frequency wave generated by the push-pull converter and performing successive voltage doubling operations to

generate a high-voltage DC output, the generated high-voltage DC output being varied as the controllable DC voltage varies so as to output various desired output voltage levels in a range that includes voltages up to approximately 30kV.

The primary reference, *Shelly*, discloses a power supply having: a DC-DC chopper-converter unit 10, which converts an input voltage VIN to a lower voltage; and a DC-DC inverter-converter 12, which converts the voltage output by the DC-DC chopper-converter 10 to an output voltage VOUT. The power supply of *Shelly* compensates for variations in the power supply's output voltage due to variations in output loading. More specifically, the power supply of *Shelly* illustrated in Fig. 1 includes a sensing network 14, which outputs a current signal i1 that varies in proportion to output voltage variations, thereby causing the output voltage of the DC-DC chopper-converter 10 to compensate for such output voltage variations. (See e.g., Fig. 1; col. 3, lines 16-36).

Page 4 of the Final Office Action acknowledges that the power supply of Shelly lacks a voltage multiplier for performing successive voltage doubling operations to generate various desired output voltage levels in a range that includes voltages up to approximately 30kV as recited in claim 31, but relies on the secondary teachings of *Gallios* as allegedly making up for this deficiency of *Shelly*. More specifically, pages 4-5 of the Office Action state that:

> ...it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Shelly to include a voltage multiplier for receiving high frequency wave generated by a push pull converter for performing successive voltage doubling operations to generate a high voltage dc output in order to provide high output voltage to a load requiring very high output voltage as taught by Gallios et al and to produce the high frequency wave at approximately 100kHz in order to afford high power density by the high switching frequency used, enabling the use of much smaller, lighter, and lower cost magnetics and capacitors.

The Final Office relies on column 5, line 31 of *Gallios* as allegedly disclosing the specific high-frequency wave output from the push-pull converter to the voltage multiplier of claim 31. Initially, Appellants note that this cited portion of *Gallios* refers to switching frequency of transistors in a power stage 20 that includes a transformer T10, not the frequency of a wave output by a push-pull converter to a voltage multiplier stage that performs successive voltage doubling operations as

claimed. Furthermore, the rejection fails to establish or even address how the particular transistor switching frequency of *Gallios* would apply to or be desirable in the power supply of *Shelly*, which is designed to output a particular voltage VOUT.

Furthermore, the rejection fails to establish that one of ordinary skill in the art would have been motivated to incorporate a voltage multiplier as allegedly taught by *Gallios* in the power supply of *Shelly*. Appellants note that the DC-DC inverter-converter 12 and DC-DC chopper-inverter 10 combination of *Shelly* is specifically designed to regulate voltage appearing at the loads being supplied therein based on the particular power supply configuration applied. (see e.g., column 3, lines 15-35). Modifying *Shelly* to incorporate a voltage multiplier with successive voltage operations would appear to require at least a significant redesign of the power conversion elements specifically disclosed therein, the desirability of which is not suggested in the prior art. Still further, the power supply of *Shelly* compensates for load-induced output voltage fluctuations with a current sensing circuit arrangement 14 that generates a current that varies in proportion to such voltage fluctuations in the particular power supply arrangement disclosed therein. Modifying the power supply of *Shelly* as asserted in the rejection would appear to render the particular disclosed current sensing arrangement 14 unsuitable for this purpose. See e.g., MPEP § 2143.02 (specifying that a proposed modification or combination relied on to assert obviousness cannot change the principle operation of the prior art being modified). Thus, it appears that the asserted combination of references is based on impermissible hindsight, relying on the claimed invention as a template instead of suggestions or motivation found in the prior art.

At least for the above reasons, Appellants submit that the asserted grounds of rejection fails to establish prima facie obviousness of claim 31.

4. The Rejection Fails to Establish *Prima Facie* Obviousness of Independent Claim 1

Independent claim 1 is directed to a high-voltage power supply (HVPS). The HVPS of claim 1 comprises: a power scaling section receiving an input voltage signal and converting the input voltage signal to a controllable DC voltage; a push-pull converter for converting the

controllable DC voltage to a high-frequency wave; and a voltage multiplier receiving the high-frequency wave generated by the push-pull converter and performing successive voltage doubling operations to generate a high-voltage DC output, the generated high-voltage DC output being varied as the controllable DC voltage varies.

The rejection applied to claim 1 is similar to that applied to independent claim 31 discussed above, except with respect to certain frequency/voltage values in claim 31 that are not recited in claim 1. Therefore, the arguments set forth with respect to claim 31 and the lack of motivation for modifying *Shelly* in view of *Gallios* to include the claimed arrangement of multiple voltage multiplying stages as claimed support Appellants' position that the asserted grounds of rejection fails to establish *prima facie* obviousness of claim 1.

Appellants further note that there is no teaching in *Shelly* that the DC-DC inverter-converter 12 outputs a high-frequency wave. Although the Examiner cites the Abstract of *Shelly*, there is no mention in the Abstract (or the remainder of *Shelly*) that the DC-DC inverter-converter 12 outputs a high-frequency wave as claimed. Page 2 of the Office Action asserts that:

> [A]pplicant has not claimed what the applicant believes to be high frequency; the examiner contends that the frequency at which the inverter of Shelly operates at is considered "high"; therefore, Shelly does disclose outputting a high frequency wave.

The proper interpretation of the term "high frequency" must be consistent with the interpretation that those skilled in the art would reach and should be consistent with the specification. See e.g., MPEP § 2111.01. Appellants submit that one of ordinary skill in the art would not interpret the term "high frequency" as meaning any frequency, particularly in the context of the claimed power supply. Thus, the Examiner's rejection of claim 1 appears to be based on an overly-broad claim interpretation.

At least for these above reasons, Applicants respectfully submit that the asserted grounds of rejection fails to establish prima facie obviousness of claim 1.

5. The Rejection Fails to Establish *Prima Facie* Obviousness of Independent Claim 18

Independent claim 18 is directed a method for providing high-voltage power. The method of claim 18 comprises: receiving an input voltage signal and scaling the input voltage signal to a controllable DC voltage; converting the controllable DC voltage to a high-frequency wave; and performing voltage multiplication on the high-frequency wave generated by the converting step to generate a high-voltage DC output, the generated high-voltage DC output being varied as the controllable DC voltage varies.

The reasoning provided for the rejection of claim 18 is the same as that applied to independent claim 1 discussed above. Therefore, the arguments set forth above with respect to claim 1 support Appellants' position that the asserted grounds of rejection fails to establish *prima facie* obviousness of claim 18.

6. The Rejection Fails to Establish *Prima Facie* Obviousness of Dependent Claim 7 or 24

Dependent claim 7 further defines the HVPS of claim 1 by specifying that the high-frequency wave generated by the push-pull converter of the high-voltage power supply is a square wave. Dependent claims 24 further defines the method of claim 18 by specifying that the high-frequency wave generated by the converting step is a square wave.

In rejecting claims 7 and 24, the Final Office Action asserts that the primary reference, *Shelly*, discloses a push-pull converter that converts controllable DC voltage to a high-frequency square wave. (see Final Office Action, page 3). Appellants note, however, that this assertion is unsupported, and there is no description in *Shelly* that the DC-DC inverter/converter 12 of *Shelly* generates a high-frequency square wave. At least for this reason, the rejection fails to establish *prima facie* obviousness of claim 7 or claim 24.

B. Issue 2: The Examiner's Rejection under 35 U.S.C. § 103(a) based on *Shelly* in view of *Gallios* and *Gak*, as applied to claims 2-6 and 23 Fails to Establish *Prima Facie* Obviousness

1. Argument Summary

The reasoning provided in support of the rejection of claims under 35 U.S.C. §103(a) as being unpatentable over *Shelly* in view of *Gallios* and *Gak* fails to establish *prima facie* obviousness of any of the rejected claims. Specifically, the deficiencies of the rejection are at least that the reliance of *Gak* as allegedly pertaining to incremental features of certain dependent claims fails to make up for the deficiencies of the asserted *Shelly-Gallios* combination addressed with respect to the independent claims.

2. The Rejection Fails to Establish *Prima Facie* Obviousness of Dependent Claims 2-6 and 23

As set forth on pages 6-7 of the Final Office Action, the rejection relies on *Gak* as allegedly teaching incremental features of dependent claims 2-6 and 23. The rejection's reliance on *Gak*, however, fails to make up for the deficiencies of the *Shelly-Gallios* combination discussed above with respect to the independent claims. Accordingly, Appellants respectfully submit that the asserted combination of *Shelly*, *Gallios*, and *Gak* (assuming these references may be combined, which Appellants do not admit) fails to establish *prima facie* obviousness of any of the above-listed claims.

C. Issue 3: The Examiner's Rejection under 35 U.S.C. § 103(a) based on *Shelly* in view of *Gallios* and *Adasko*, as applied to claims 13-17 Fails to Establish *Prima Facie* Obviousness

1. Argument Summary

The reasoning provided in support of the rejection of claims under 35 U.S.C. §103(a) as being unpatentable over *Shelly* in view of *Gallios* and *Adasko* fails to establish *prima facie* obviousness of any of the rejected claims. Specifically, the deficiencies of the rejection are at least that the reliance of *Adasko* as allegedly pertaining to incremental features of certain dependent claims fails to make up for the deficiencies of the asserted *Shelly-Gallios* combination addressed with respect to the independent claims. Furthermore, the reasoning in support of the rejection mischaracterizes the nature of certain features in these dependent claims and attributes teachings to the prior art that are not supported by the record.

2. The Rejection Fails to Establish *Prima Facie* Obviousness of Dependent Claims 13-17

As set forth on pages 8-9 of the Final Office Action, the rejection relies on *Adasko* as allegedly teaching incremental features of dependent claims 13-17. The rejection's reliance on *Adasko*, however, fails to make up for the deficiencies of the *Shelly-Gallios* combination discussed above with respect to the independent claims. Accordingly, Appellants respectfully submit that the asserted combination of *Shelly*, *Gallios*, and *Adasko* (assuming these references may be combined, which Appellants do not admit) fails to establish *prima facie* obviousness of any of the above-listed claims. Further reasoning in support of additional features of certain of these dependent claims is presented below.

3. The Rejection Fails to Establish *Prima Facie* Obviousness of Dependent Claim 14

As depending from claim 13 (which depends on claim 1), claim 14 further defines the HVPS of claim 1 by specifying that that the voltage multiplier of the HVPS includes a plurality of voltage doubler stages on a circuit board and that the HVPS further comprises an insulation system associated with the circuit board, wherein the insulation system is a multi-layer system of n layers of insulation and m strips positioned between successive insulating layers.

As shown in Fig. 1, the printed circuit board of *Adasko* includes an insulation layer 9. Appellants submit, however, that the asserted secondary reference, *Adasko*, fails to teach the insulation arrangement of claim 14, which is a multi-layer system of n layers of insulation and m strips positioned between successive insulating layers.

4. The Rejection Fails to Establish *Prima Facie* Obviousness of Dependent Claim 16

As depending from claim 13 (which depends on claim 1), claim 16 further defines the HVPS of claim 1 by specifying that that the voltage multiplier of HVPS includes a plurality of voltage doubler stages on a circuit board and that the HVPS further comprises an insulation system associated with the circuit board, wherein the plurality of voltage doubler stages are divided among multiple circuit boards, separate from the power scaling section and the push-pull converter.

Appellants submit that the asserted secondary reference, *Adasko*, fails to teach this or suggest this particular arrangement of voltage doubler stages relative to the power scaling section and the push-pull converter.

With apparent reference to claim 16, the rejection on page 8 of the Final Office Action asserts that:

> First, it has been held that forming in one piece an article which has formerly been formed in two pieces and put together (such as integrating circuit

> components on a circuit board) involves only routine skill in the art. *Howard v. Detroit Stove works*, 150 U.S. 164 (1893). Therefore, integrating parts on a circuit board is routinely obvious to one having ordinary skill in the art.
>
> Secondly, duplication of parts is well known in the art; since it has bee[n] held that mere duplication of the essential working parts of a device (such as connecting plural circuit boards together) involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8. Therefore, duplicating multiple voltage doubler circuit boards is routinely obvious to one having ordinary skill in the art.

This reasoning mischaracterizes the invention defined in claim 16. More specifically, claim 16 does not merely relate to an obvious integration of circuit boards or a routine duplication of parts, and instead defines a particular arrangement of a plurality of voltage doubling stages relative to a power scaling section and a push-pull converter of an HVPS, providing certain benefits described for example at paragraph [0037] of the present application.

5. The Rejection Fails to Establish *Prima Facie* Obviousness of Dependent Claim 17

As depending from claim 13 (which depends on claim 1), claim 17 further defines the HVPS of claim 1 by specifying that that the voltage multiplier of the HVPS includes a plurality of voltage doubler stages on a circuit board and that the HVPS further comprises an insulation system associated with the circuit board, wherein the plurality of voltage doubler stages include capacitors arranged in a pattern in which adjacent capacitors are non-parallel, so as to diverge on one end.

Although claim 17 is included in the rejection based on the additional *Adasko* reference, the feature of claim 17 is not addressed in the rejection, and is not found in *Adasko*. Therefore, the rejection fails to establish *prima facie* obviousness of claim 17.

At least in view of the above, Appellants respectfully submit that all asserted rejections should be withdrawn.

VIII. CLAIMS

A copy of the claims involved in the present Appeal are attached hereto as Appendix A.

IX. EVIDENCE

There is no additional evidence pursuant to §§ 1.130, 1.131, or 1.132 and/or evidence entered by or relied upon by the examiner that is relevant to this appeal as noted in Appendix B.

X. RELATED PROCEEDINGS

No related proceedings are referenced in II. above, and thus, no copies of decisions in related proceedings are provided.

XI. CONCLUSION

The withdrawal of the outstanding rejections and the allowance of all pending claims are earnestly solicited.

The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17, and 1.21 that may be required by this paper and to credit any overpayment to Deposit Account No. 02-2448.

Dated: May 19, 2006

Respectfully submitted,

D. Richard Anderson
Registration No.: 40,439
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Rd
Suite 100 East
P.O. Box 747
Falls Church, Virginia 22040-0747
(703) 205-8000
Attorney for Appellant

APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/630,684 are as follows:

1. (Previously Presented) A high-voltage power supply, comprising:

a power scaling section receiving an input voltage signal and converting said input voltage signal to a controllable DC voltage;

a push-pull converter for converting said controllable DC voltage to a high-frequency wave; and

a voltage multiplier receiving said high-frequency wave generated by said push-pull converter and performing successive voltage doubling operations to generate a high-voltage DC output, the generated high-voltage DC output being varied as said controllable DC voltage varies.

2. (Original) The high-voltage power supply of claim 1, further comprising:

a control module for controlling said power scaling section and said push-pull converter.

3. (Original) The high-voltage power supply according to claim 2, wherein

said power scaling section includes a switching element, a duty cycle of which controls the amplitude of said controllable DC voltage, and

said control module outputs a gate switching signal to said switching element of said power scaling section as a function of a desired output voltage of the high-voltage power supply.

4. (Original) The high-voltage power supply according to claim 3, wherein said control module receives a feedback signal based on the output of said power scaling section to adjust said gate switching signal.

5. (Original) The high-voltage power supply according to claim 2, wherein

said push-pull converter includes a plurality of switching elements and a transformer for

generating said high-frequency wave, and
said control module outputs gate switching signals to the switching elements of said push-pull converter to control the frequency of said high-frequency wave.

6. (Original) The high-voltage power supply according to claim 5, wherein said switching elements are MOSFET switching elements.

7. (Original) The high-voltage power supply according to claim 1, wherein said high-frequency wave is a square wave.

8. (Original) The high-voltage power supply according to claim 1, wherein the frequency of said high-frequency wave is approximately 100 kHz.

9. (Previously Presented) The high-voltage power supply according to claim 1, wherein said controllable DC voltage is in the range of approximately 0-to-28 V.

10. (Original) The high-voltage power supply according to claim 1, wherein said power supply generates an output voltage of in the range of approximately 0-to-30 kV, DC.

11. (Original) The high-voltage power supply according to claim 1, wherein said high-frequency wave has an amplitude of approximately 0-to-1 kV.

12. (Original) The high-voltage power supply according to claim 2, wherein said control module is an analog controller.

13. (Original) The high-voltage power supply according to claim 1, wherein said voltage multiplier includes a plurality of voltage doubler stages on a circuit board and said high-voltage power supply further comprises an insulation system associated with said circuit board.

14. (Original) The high-voltage power supply according to claim 13, wherein said insulation system is a multi-layer system of *n* layers of insulation and *m* conducting strips positioned between successive insulating layers.

15. (Original) The high-voltage power supply according to claim 13, wherein said insulation system is a field-controlled multi-layer insulation system.

16. (Original) The high-voltage power supply according to claim 13, wherein said plurality of voltage doubler stages are divided among multiple circuit boards, separate from said power scaling section and said push-pull converter.

17. (Previously Presented) The high-voltage power supply according to claim 13, wherein said plurality of voltage doubler stages include capacitors arranged in a pattern in which adjacent capacitors are non-parallel, so as to diverge on one end.

18. (Previously Presented) A method for providing high-voltage power, comprising:
receiving an input voltage signal and scaling said input voltage signal to a controllable DC voltage;

converting said controllable DC voltage to a high-frequency wave; and

performing voltage multiplication on said high-frequency wave generated by said converting step to generate a high-voltage DC output, the generated high-voltage DC output being varied as said controllable DC voltage varies.

19. (Original) The method of claim 18, further comprising:

controlling said scaling and converting steps in accordance with a command signal.

20. (Original) The method according to claim 19, wherein

said scaling step is performed by a power scaling section having a switching element, a duty cycle of which controls the amplitude of said controllable DC voltage, and

said step of controlling outputs a gate switching signal to the switching element of the power scaling section as a function of a desired output voltage.

21. (Original) The method claim 20, wherein said controlling step generates said gate switching signal as a function of a feedback signal indicating the output of the power scaling section.

22. (Original) The method according to claim 19, wherein

said converting step is performed by push-pull converter that includes a plurality of switching elements and a transformer for generating said high-frequency wave, and

said controlling step outputs a gate switching signal to the switching elements of said push-pull converter to control the frequency of said high-frequency wave.

23. (Original) The method according to claim 22, wherein said switching elements are MOSFET switching elements.

24. (Original) The method according to claim 18, wherein said high-frequency wave is a square wave.

25. (Original) The method according to claim 18, wherein the frequency of said high-frequency wave is approximately 100 kHz.

26. (Previously Presented) The method according to claim 18, wherein said controllable DC voltage is in the range of approximately 0-to-28 V.

27. (Original) The method according to claim 18, wherein said method generates an output voltage of approximately 0-to-30 kV, DC.

28. (Original) The method according to claim 18, wherein said high-frequency wave has an amplitude of 0-to-1 kV.

29. (Previously Presented) The high-voltage power supply according to claim 1, wherein the frequency of said high-frequency wave is greater than approximately 20 kHz.

30. (Previously Presented) The method according to claim 18, wherein the frequency of said high-frequency wave is greater than approximately 20 kHz.

31. (Previously Presented) A high-voltage power supply, comprising:

a power scaling section receiving an input voltage signal and converting said input voltage signal to a controllable DC voltage;

a push-pull converter for converting said controllable DC voltage to a high-frequency wave, said high-frequency wave having a frequency greater than approximately 20 kHz; and

a voltage multiplier receiving said high-frequency wave generated by said push-pull converter and performing successive voltage doubling operations to generate a high-voltage DC output, the generated high-voltage DC output being varied as said controllable DC voltage varies so as to output various desired output voltage levels in a range that includes voltages up to approximately 30kV.

APPENDIX B

There is no additional evidence pursuant to §§ 1.130, 1.131, or 1.132 and/or evidence entered by or relied upon by the examiner that is relevant to this appeal.

APPENDIX C

There are no related proceedings.